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Superconducting gaps in FeSe studied by soft point-contact Andreev reflection spectroscopy

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Abstract

© 2017 American Physical Society. FeSe single crystals have been studied by soft point-contact Andreev reflection spectroscopy. Superconducting gap features in the differential resistance dV/dI(V) of point contacts such as a characteristic Andreev reflection double-minimum structure have been measured versus temperature and magnetic field. Analyzing dV/dI within the extended two-gap Blonder-Tinkham-Klapwijk model allows one to extract both the temperature and magnetic field dependence of the superconducting gaps. The temperature dependence of both gaps is close to the standard BCS behavior. Remarkably, the magnitude of the double-minimum structure gradually vanishes in magnetic field, while the minima position only slightly shifts with field, indicating a weak decrease of the superconducting gaps. Analyzing the dV/dI(V) spectra for 25 point contacts results in the averaged gap values (ΔL)=1.8±0.4meV and (ΔS)=1.0±0.2 meV and reduced values 2(ΔL)/kBTc=4.2±0.9 and 2(ΔS)/kBTc=2.3±0.5 for the large (L) and small (S) gap, respectively. Additionally, the small gap contribution was found to be within tens of percent, decreasing with both temperature and magnetic field. No signatures in the dV/dI spectra were observed, testifying to a gapless superconductivity or the presence of even smaller gaps.

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